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SPS/ABM/ED

CM-P00057998

2nd March 1977

Mlle Susan LEECH/Bib.SPS
Commissioning = 2 ex.

SPS Commissioning Report No. 49

Subject : Computation of the slow-extraction effective spill time using
a Biomation transient recorder.

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A program has been developed to compute the slow-extraction effective spill time defined according to the following formula:

$$DY = \frac{\left[\sum_{i=1}^L m(i\tau) \right]^2}{\sum_{i=1}^L m^2(i\tau)}$$

where $\tau = 2$ ms
 $L =$ number of samples covering the spill duration
 $m(i\tau)$ are the samples of the spill signal (BSI 61316)
read out from the BIOMATION transient recorder
located in BA6 (8 bits accuracy).

This DY is a fair approximation of the quantity T_e defined in formula (6) of ref. 1. DY takes into account all frequencies of the spill up to 250 Hz.

Following the test of the program using a square wave generator in BA6, the signal from the BSI 61316 was connected to the first channel of the Biomation. Figures 1 and 2 show the results for two different spills taken parasitically during the machine development session of 22.2.1977. The RF servo-spill was off and slow extraction was initiated in an open loop with a perturbation on the main QF power supply.

Two programs are involved. Program <66> DYNIT provides the facilities for initialising the Biomation and starting or stopping the periodic execution of program <111> DUTYCY, which in turn reads out the Biomation memory, finds out the beginning and end of the slow-extraction time (= TE) by detecting when the signal is over a given threshold (presently set to ~ 200 mV) and finally computes the effective spill time DY.

Program <111> DUTYCY is executed every cycle and prints out on the label zone of the knob the duration of the slow extraction, the effective spill time (in units of ms) and the ratio between the two (in percent). A star sign indicates when a measurement is in course. The first two values may be also accessed directly in the same file <111> DUTYCY, respectively under name ET or DY. When ET or DY or both cannot be computed for any reason, they are given the values -1.

The trigger which starts the Biomation recording has the same timing as the one controlling the RF servo-spill. It is updated each time the 'init/repeat' touch button is pressed. Only the next 2 s (i.e. 1000 samples) are read out. It should be noted that initialisation is always followed by the scheduling of <111> DUTYCY.

The program takes between 5 and 6 seconds for its execution, of which the first 2 seconds are used for transfer of data from the Biomation and the rest in the computation itself, the latter being time consuming as it is presently done in NODAL. It is planned to improve this time by writing up a small MAC routine. Concurrently, it is foreseen to speed up the Biomation transfer time when the new BOM data-module will be available.

ref. 1 : 'On the measurement of the slow ejected beam structure'
D. Bloess, D. Dekkers, G. Shering, CERN/MPS/SR 69-9.

Fig. 1

extraction time : 412 ms
effective spill time: 140 ms
efficiency : 34 %

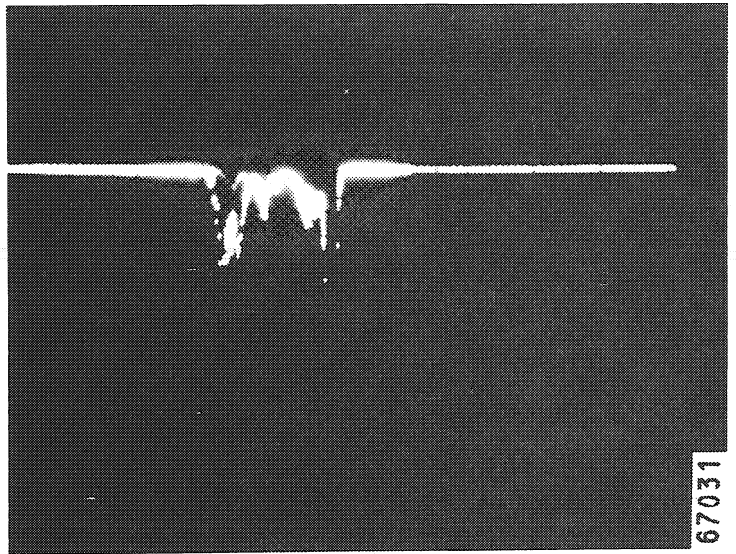


Fig. 2

extraction time : 570 ms
effective spill time: 305 ms
efficiency : 53 %

